WHAT IS CLAIMED IS:

1. A liquid crystal display device comprising a pair of substrates and a liquid crystal layer provided between the substrates, wherein liquid crystal molecules in the liquid crystal layer have a negative dielectric anisotropy, and the liquid crystal molecules are aligned in a direction substantially vertical to the substrates when no voltage is being applied and axis-symmetrically aligned in each of a plurality of pixel regions under application of a voltage.

2. A liquid crystal display device according to claim 1, wherein a thickness (d_{in}) of the liquid crystal layer in the pixel region is larger than a thickness (d_{out}) of the liquid crystal layer outside of the pixel region, and the device includes a homeotropic alignment layer in a region corresponding to the pixel region on a surface of at least one of the substrates on the liquid crystal layer side.

3. A liquid crystal display device according to claim 2, wherein at least one of the substrates has convex portions defining the pixel region on a surface on the

liquid crystal layer side.

4. A liquid crystal display device according to claim 1, wherein the thickness of the liquid crystal layer in the pixel region is largest at a central portion of the pixel region and continuously decreases toward a peripheral portion of the pixel region.

5. A liquid crystal display device according to claim 4, wherein the thickness of the liquid crystal layer in the pixel region is axis-symmetrically changed around the central portion of the pixel region.

6. A liquid crystal display device according to claim 1, further comprising a projection at the central portion of the pixel region, wherein the liquid crystal molecules are axis-symmetrically aligned around the projection under the application of a voltage.

7. A liquid crystal display device according to claim 1, wherein a retardation $d \cdot \Delta n$ of the liquid crystal layer is in a range of about 300 nm to about 500 nm.

8. A liquid crystal display device according to claim 1,

wherein a twist angle of the liquid crystal layer is in a range of about 45° to about 110°.

9. A liquid crystal display device according to claim 1, comprising a pair of polarizing plates disposed in crossed Nicols on both sides of the liquid crystal layer, a phase difference plate having a relationship, in which a refractive index $n_{x,y}$ in an in-plane direction is greater than a refractive index n_z in a direction vertical to a plane, being provided on at least one of the polarizing plates.

10. A liquid crystal display device according to claim 1, wherein an axis-symmetrical alignment fixing layer which provides the liquid crystal molecules with an axis-symmetrical pretilt angle is further formed on a surface of at least one of the substrates on the liquid crystal layer side.

11. A liquid crystal display device according to claim 10, wherein the axis-symmetrical alignment fixing layer contains a photocurable resin.

12. A method for producing a liquid crystal display

device, comprising the steps of:

forming a homeotropic alignment layer on a pair of substrates, respectively;

disposing a mixture containing a liquid crystal material having a negative dielectric anisotropy and a photocurable resin between the homeotropic alignment layers on the substrates; and

curing the photocurable resin while applying a voltage higher than a threshold voltage of the liquid crystal material to the mixture, so as to form an axis-symmetrical alignment fixing layer providing the liquid crystal molecules with an axis-symmetrical pretilt angle.

13. A method for producing a liquid crystal display device according to claim 12, further comprising the step of forming convex portions defining pixel regions on a surface of at least one of the substrates before the step of forming the homeotropic alignment layers on the substrates.

14. A liquid crystal display device, comprising: a plasma substrate having plasma chambers for performing plasma discharge; a counter substrate having signal electrodes; and a liquid crystal layer provided between the plasma

substrate and the counter substrate, the device being driven by the signal electrodes and the plasma chambers,

wherein liquid crystal molecules in the liquid crystal layer have a negative dielectric anisotropy, and the liquid crystal molecules are aligned in a direction substantially vertical to the substrates when no voltage is being applied and axis-symmetrically aligned in each of a plurality of pixel regions under application of a voltage.

15. A liquid crystal display device according to claim 14, wherein a thickness (d_{in}) of the liquid crystal layer in the pixel region is larger than a thickness (d_{out}) of the liquid crystal layer outside of the pixel region, and the device includes a homeotropic alignment layer in a region corresponding to the pixel region on a surface of at least one of the substrates on the liquid crystal layer side.

16. A liquid crystal display device according to claim 15, wherein at least one of the counter substrate and the plasma substrate has convex portions defining the pixel region on a surface on the liquid crystal layer side.

17. A liquid crystal display device according to claim 14, wherein the thickness of the liquid crystal layer in the pixel region is largest at a central portion of the pixel region and continuously decreases toward a peripheral portion of the pixel region.

18. A liquid crystal display device according to claim 17, wherein the thickness of the liquid crystal layer in the pixel region is axis-symmetrically changed around the central portion of the pixel region.

19. A liquid crystal display device according to claim 14, comprising a pair of polarizing plates disposed in crossed-Nicols on both sides of the liquid crystal layer, a polarization axis of one of the polarizing plates being parallel to an extending direction of the signal electrodes or the plasma chambers.

20. A liquid crystal display device according to claim 14, wherein an axis-symmetrical alignment fixing layer which provides the liquid crystal molecules with an axis-symmetrical pretilt angle is further formed on a surface of at least one of the plasma substrate and the counter substrate on the liquid crystal layer side.

21. A liquid crystal display device according to claim 20, wherein the axis-symmetrical alignment fixing layer contains a photocurable resin.

22. A liquid crystal display device, comprising: a pair of substrates and a liquid crystal layer provided between the substrates,

wherein liquid crystal molecules in the liquid crystal layer have a negative dielectric anisotropy, and the liquid crystal molecules are aligned in a direction substantially vertical to the substrates when no driving voltage is being applied and axis-symmetrically aligned around an axis-symmetrical alignment central axis in each of a plurality of pixel regions under application of a driving voltage, and

convex portions defining the pixel region are provided on a surface of at least one of the substrates on the liquid crystal layer side, and a treatment for controlling a position of the axis-symmetrical alignment central axis is conducted.

23. A liquid crystal display device according to claim 22, comprising a region in which the liquid crystal molecules keep a homeotropic alignment state under

application of an axis-symmetrical alignment central axis forming voltage at each predetermined position in the plurality of pixel regions.

24. A liquid crystal display device according to claim 23, wherein Sa is an area of the region in which the liquid crystal molecules keep a homeotropic alignment state under the application of the axis-symmetrical alignment central axis forming voltage, A is an area of the pixel region, and Sa/A satisfies the relationship $0 < Sa/A < 4\%$.

25. A liquid crystal display device according to claim 22, comprising an axis-symmetrical alignment central axis forming portion at a predetermined position in each of the plurality of pixel regions, and the axis-symmetrical alignment central axis of the liquid crystal molecules is formed corresponding to the axis-symmetrical alignment central axis forming portion.

26. A liquid crystal display device according to claim 25, wherein Sb is an area of the axis-symmetrical alignment central axis forming portion, A is an area of the pixel region, and Sb/A satisfies the relationship $0 <$

Sb/A < 4%.

27. A liquid crystal display device according to claim 22, wherein a thickness of the liquid crystal layer in the pixel region is larger than a thickness of the liquid crystal layer outside of the pixel region.

28. A liquid crystal display device according to claim 27, wherein the thickness of the liquid crystal layer in the pixel region is largest at a central portion of the pixel region and continuously decreases from the central portion to a peripheral portion of the pixel region.

29. A liquid crystal display device according to claim 28, wherein the thickness of the liquid crystal layer in the pixel region is axis-symmetrically changed around the central portion of the pixel region.

30. A liquid crystal display device according to claim 22, wherein an axis-symmetrical alignment fixing layer is provided on a surface of at least one of the substrates on the liquid crystal layer side.

31. A liquid crystal display device according to claim

30, wherein the axis-symmetrical alignment fixing layer contains a photocurable resin.

32. A method for producing a liquid crystal display device including a pair of substrates and a liquid crystal layer provided between the substrates, liquid crystal molecules in the liquid crystal layer having a negative dielectric anisotropy, the liquid crystal molecules being aligned in a direction substantially vertical to the substrates when no driving voltage is being applied and being axis-symmetrically aligned around an axis-symmetrical alignment central axis in each of a plurality of pixel regions under application of a driving voltage,

the method comprising the step of performing an axis-symmetrical alignment central axis forming process.

33. A method for producing a liquid crystal display device according to claim 32, wherein the axis-symmetrical alignment central axis forming process includes the steps of:

disposing a precursor mixture containing a liquid crystal material and a photocurable material between the substrates; and

curing the photocurable material while applying an axis-symmetrical alignment central axis forming voltage to the precursor mixture.

34. A method for producing a liquid crystal display device according to claim 33, wherein the axis-symmetrical alignment central axis forming voltage is 1/2 or more of a threshold voltage of the liquid crystal material.

35. A method for producing a liquid crystal display device according to claim 33, wherein the axis-symmetrical alignment central axis forming voltage is an AC voltage.

36. A method for producing a liquid crystal display device according to claim 35, wherein a frequency of the AC voltage is 1 Hz or more.